II. PROPERTY DESCRIPTION

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II. PROPERTY DESCRIPTION

The property description addresses general and site-specific ecological parameters that affect the three-unit Mouth of Cottonwood Creek Wildlife Area. Understanding these parameters is the foundation for adaptively managing the resources at this site.

PHOTO: The mouth of Cottonwood Creek. Right foreground is the easternmost point in the Wildlife Area. July 2005 SEI, C. Remy

A. Geographical Setting

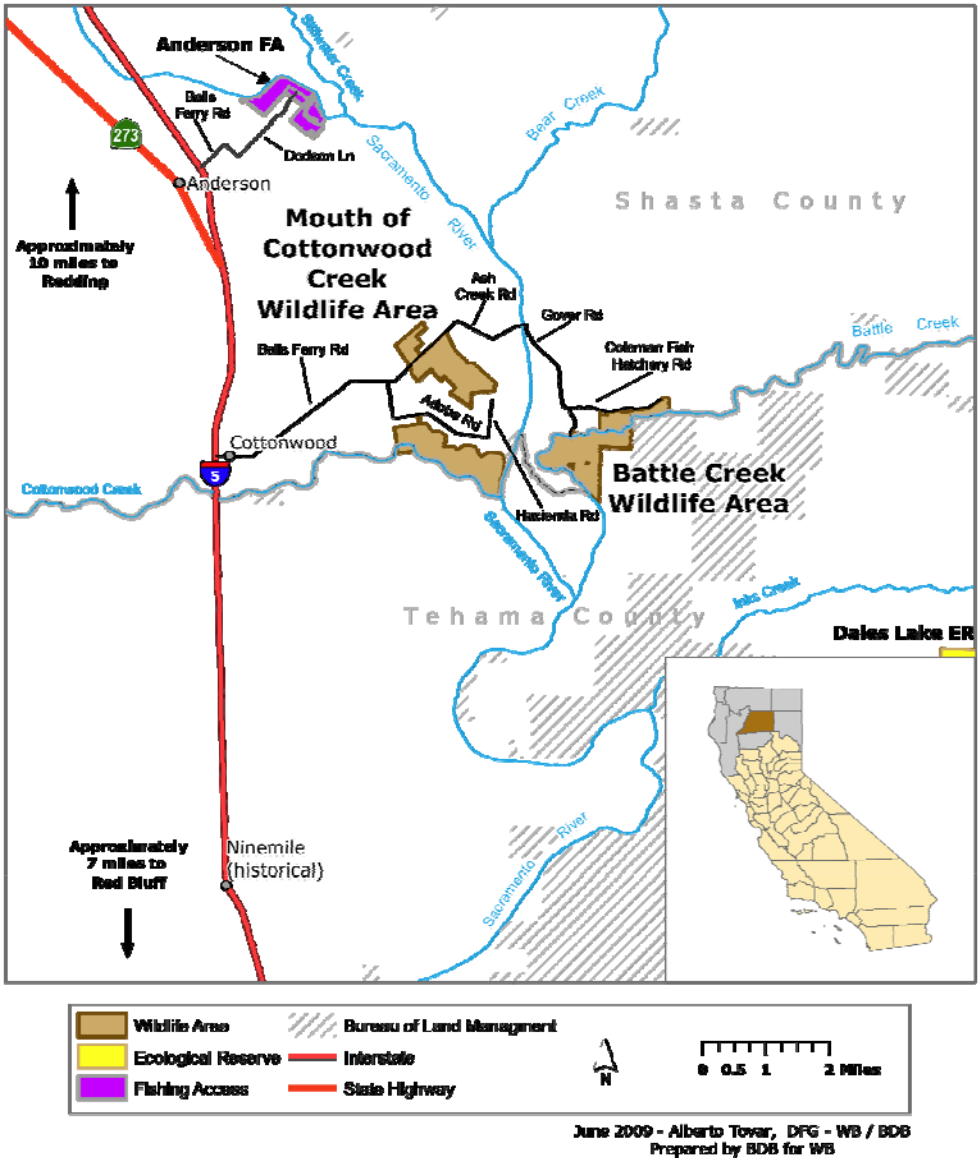
The approximately 1,059-acre Mouth of Cottonwood Creek Wildlife Area (MCCWA) is situated in the northernmost portion of the Sacramento Valley in California. The Sacramento Valley is bordered by the Coast Range to the west, the Siskiyou Mountains and Cascade Range to the north, the Sierra Nevada to the east, and the San Joaquin Valley to the south. The dominant landscape feature of the valley is the 384-mile Sacramento River, which has its headwaters in the Cascade Range and flows south to the Sacramento-San Joaquin Delta and San Francisco Bay. Gently sloping to nearly flat in some areas, the valley floor consists of deep alluvial soils formed by floodplains and terraces (Hill 1984).

As its name implies, the Mouth of Cottonwood Creek Wildlife Area is located near the confluence of Cottonwood Creek and the Sacramento River. Cottonwood Creek drains a watershed area of 927 square miles and remains the largest undammed westside tributary to the Sacramento River (CH2MHill 2002). The Cottonwood Creek Unit, the original unit of the

Wildlife Area, is situated along the north bank of Cottonwood Creek at its confluence with the Sacramento River. This unit lies entirely within the 100-year floodplain of the creek, Ranging from 350 to 400 feet above sea level, the unit provides a mosaic of riverine, riparian, wetland and upland habitats. Approximately three-quarters of a mile to the north lie the Balls Ferry Wetland Units 1 and 2 (BFW1, BFW2). At 410 to 420 feet above sea level, both these units are flat to gently sloping, and provide freshwater wetlands, annual grasslands, riparian and ruderal habitats.

Cottonwood Creek also forms the southernmost boundary of Shasta County (Figure II-a). Five miles to the west is U.S. Interstate 5 and the small town of Cottonwood, population 2,960 (U.S. Census Bureau 2006). Fifteen miles to the northwest is Redding, the largest city in the northern region of the Sacramento Valley and the government seat of Shasta County. Between 2000 and 2005, Shasta County grew by more than 10% (ibid.); Redding remains one of the fastest growing cities in the nation (ibid.).

Figure II-a. Regional Location, Mouth of Cottonwood Creek Wildlife Area



B. Property Boundaries and Adjacent Land Use

1. Cottonwood Creek Unit

The Cottonwood Creek Unit was initially purchased from the Anderson-Cottonwood Irrigation District (ACID) in 1981 and additional holdings were acquired piecemeal until 1993 (Table II-a,; Appendix A). The unit is situated in Township 29N, Range 3W, on the U.S. Geological Survey (USGS) 7.5 minute Balls Ferry quadrangle, and includes portions of Sections 4, 5, 8, and 9 (Figure II-b). The northern and western boundaries are adjacent to private land. The easternmost boundary is the Sacramento River and the Reading Island Recreation Site managed by the Bureau of Land Management. The precise location of the southern boundary of the Cottonwood Creek Unit has yet to be determined; therefore, the exact acreage is unknown. On most maps, it is shown as Cottonwood Creek, which is also the boundary between Shasta and Tehama counties. The Cottonwood Creek Unit ownership map, prepared for this plan in 2008, used the Shasta and Tehama county assessor parcel maps to depict the southern boundary Figure II-c). The meandering channel of Cottonwood Creek shifts up to 400 feet a year in response to winter flooding, as discussed under hydrology later in this section (IIC3; Figure II-j). This changing southern boundary may account for the discrepancy between the listed unit acreage of 571 and the 2008 mapped vegetation community acreage of 509 (IIIA).

The Cottonwood Creek Unit is accessed from Adobe Road. There is one public access point via a walk-in trail parallel to a gated and locked private access road just south of the intersection of Adobe Road and Hacienda Road. A small graded parking lot is provided adjacent to the entrance. A second gated and locked access road is located approximately 0.5 mile west of this parking area and is a shared easement with the ACID.

Land use in the area is predominantly rural agriculture, primarily grazing lands, as can be seen in the aerial parcel map (Figure II-d). Typical residences in this area are homes on large lots, ranchette-style homes with small acreage and ranches with houses and outbuildings.

2. Balls Ferry Wetland Units 1 and 2

Approximately three-quarters of a mile north of the Cottonwood Creek Unit between Venzke and Balls Ferry roads lies the 348-acre Balls Ferry Wetland Unit 1 (BFW1), acquired from the Dymesich estate in 2004. The 141-acre Balls Ferry Wetland Unit 2 (BFW2), acquired from the Matthews family in 2008, is adjacent to the northwestern section of BFW1 and includes property north of Balls Ferry Road and east of Webb Road (Table II-a; Appendix A). Both the Balls Ferry wetland units are depicted on the USGS 7.5 minute Balls Ferry quadrangle (Figure II-b).

BFW1 is situated across portions of Township 29N and 30N, Range 3W, and includes portions of Sections 32, 33, and 4. BFW2 is located in Section 32 of Township 30N, Range 3W, as depicted on the topographic parcel map (Figure II-e)

BFW1 can be accessed from either Balls Ferry or Venzke Roads; both are paved two-lane roads maintained by Shasta County. Access to BFW2 is via Balls Ferry Road and Webb Road. Like the Cottonwood Creek Unit, land use around the Balls Ferry wetland units consists of rural residential homes and agriculture, primarily irrigated pasture, as evidenced in the aerial map of the wetland units (Figure II-f).

Table II-a. Acquisition History, Mouth of Cottonwood Creek Wildlife Area

Year	Acres	Unit	County	APN	Twn	Rng	Sec	Funding	Prior Owner
1981	261.71	CCU	Shasta	089-310-002 “	29N 29N	03W 03W	8 9	Environmental License Plate Fund	ACID
1982	54.73	CCU	Shasta	089-190-005 089-220-004 089-310-005	29N 29N 29N	03W 03W 03W	9 9 9	Energy Resources Fund	Moore
1991	59.60	CCU	Shasta	089-210-001	29N	03W	9	Prop 70 Sec 5907	Herrick
1992	166.32	CCU	Shasta	089-230-003 089-230-003 089-0240-0018 089-250-002	29N 29N 29N 29N	03W 03W 03W 03W	5 8 5 5	Prop 70 Sec 5907	Chastain
1992	16.53	CCU	Tehama	009-030-022-1	29N	03W	5	Prop 70 Sec 5907	Chastain
1993	12.22	CCU	Shasta	089-020-006	29N	03W	8	Prop 70 Sec 5907	Moore
2004	346.31	BFW1	Shasta	089-010-001 089-010-001 089-010-003 089-010-003 089-060-001 089-060-001 089-060-001 089-070-009 089-080-001 089-080-001 089-090-008	30N 30N 30N 30N 29N 30N 30N 29N 29N 30N 29N	03W 03W 03W 03W 03W 03W 03W 03W 03W 03W 03W	32 33 32 33 04 32 33 04 04 33 04	Prop 50	Dymesich
2008	141.6	BFW2	Shasta	089-020-001 091-230-003 091-190-004	30N	03W	32	Prop 40	Matthews

APN = Assessor Parcel Numbers ACID = Anderson-Cottonwood Irrigation District
CCU = Cottonwood Creek Unit; BFW1 = Balls Ferry Wetland Unit 1; BFW2=Balls Ferry Wetland Unit 2

Figure II-b. Boundary Map, Mouth of Cottonwood Creek Wildlife Area (Townships 29N and 30N, Range 3W)

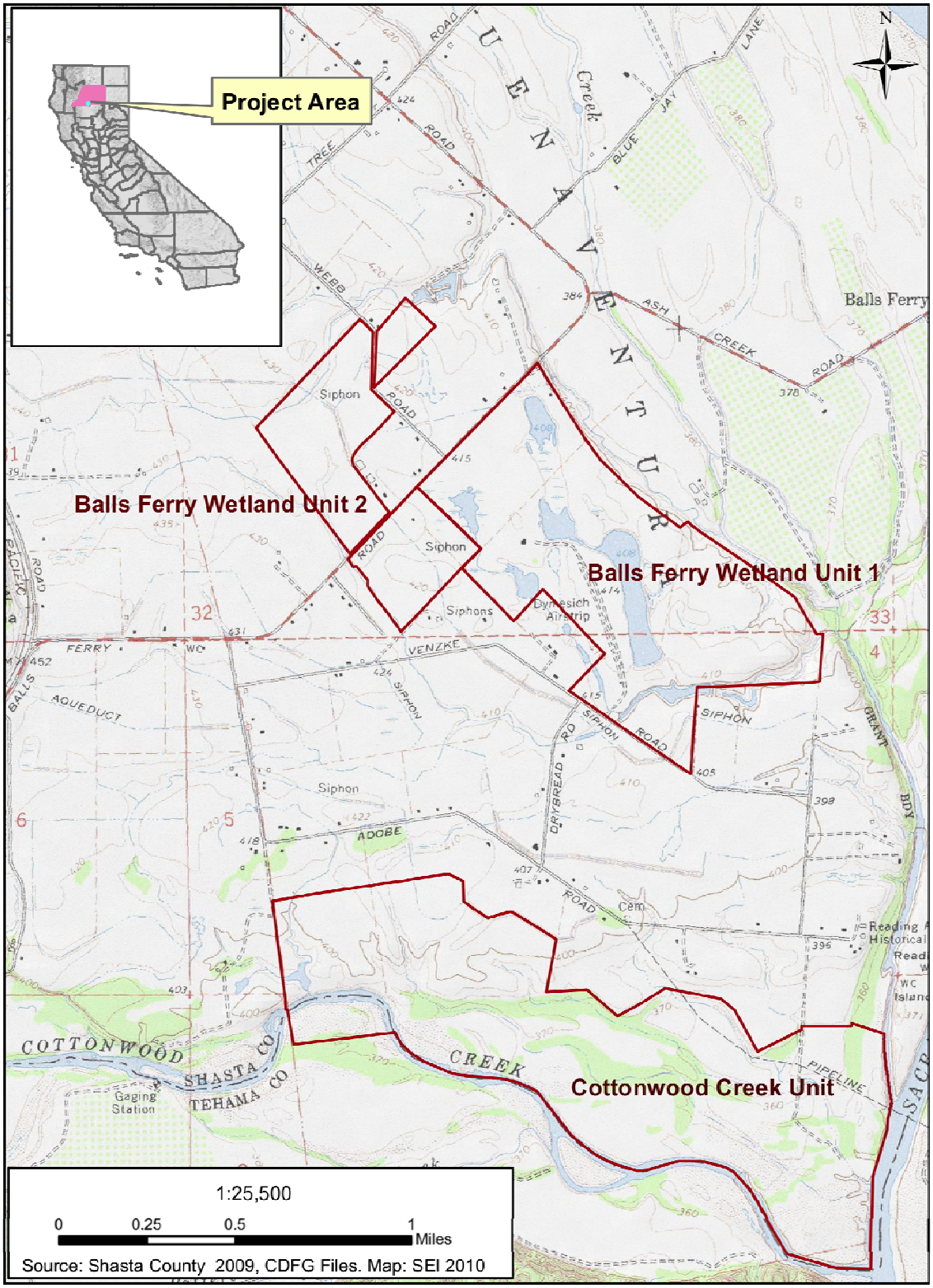


Figure II-c. Parcel Boundaries, Cottonwood Creek Unit (topographic view)

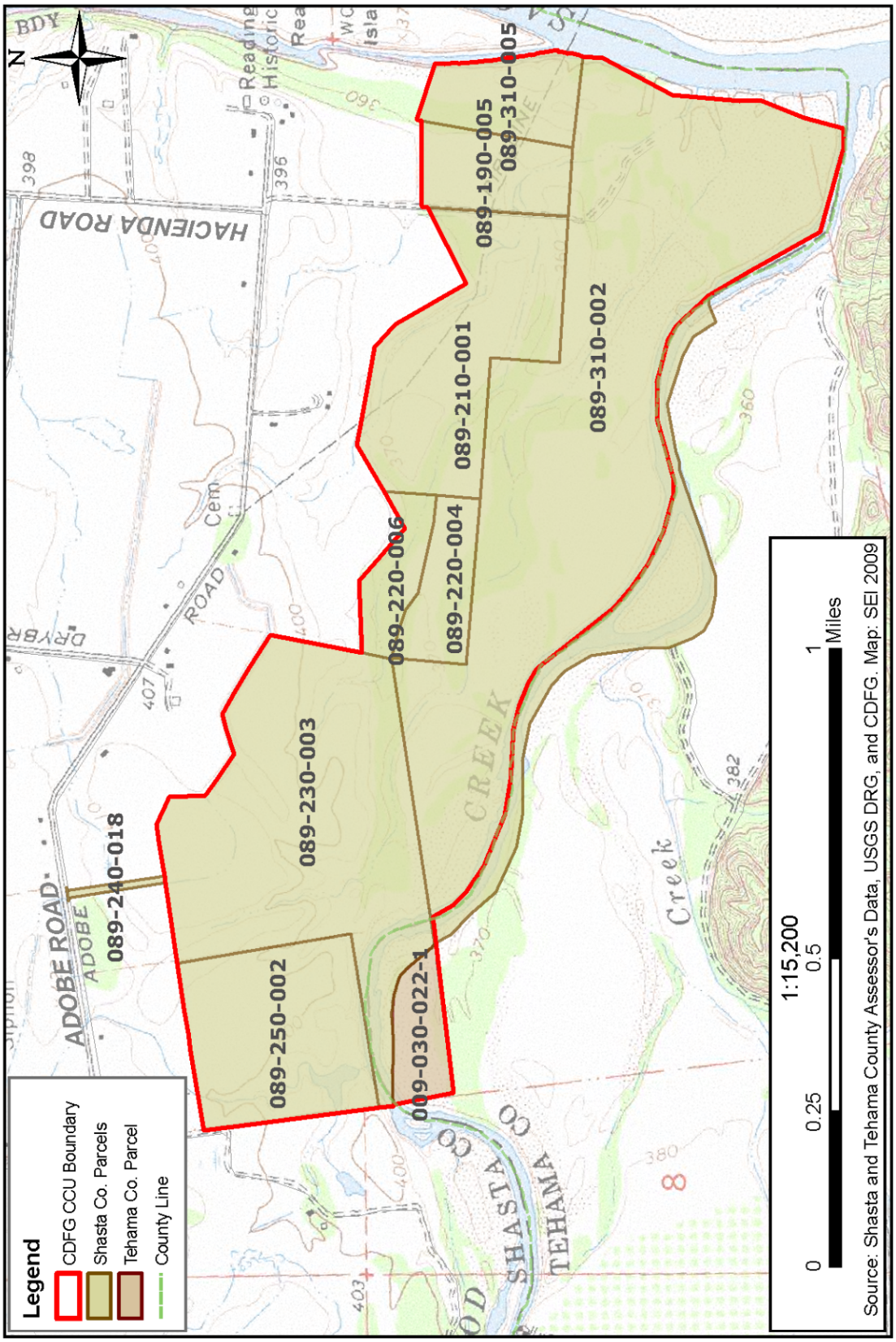


Figure II-d. Parcel Boundaries, Cottonwood Creek Unit (aerial view)

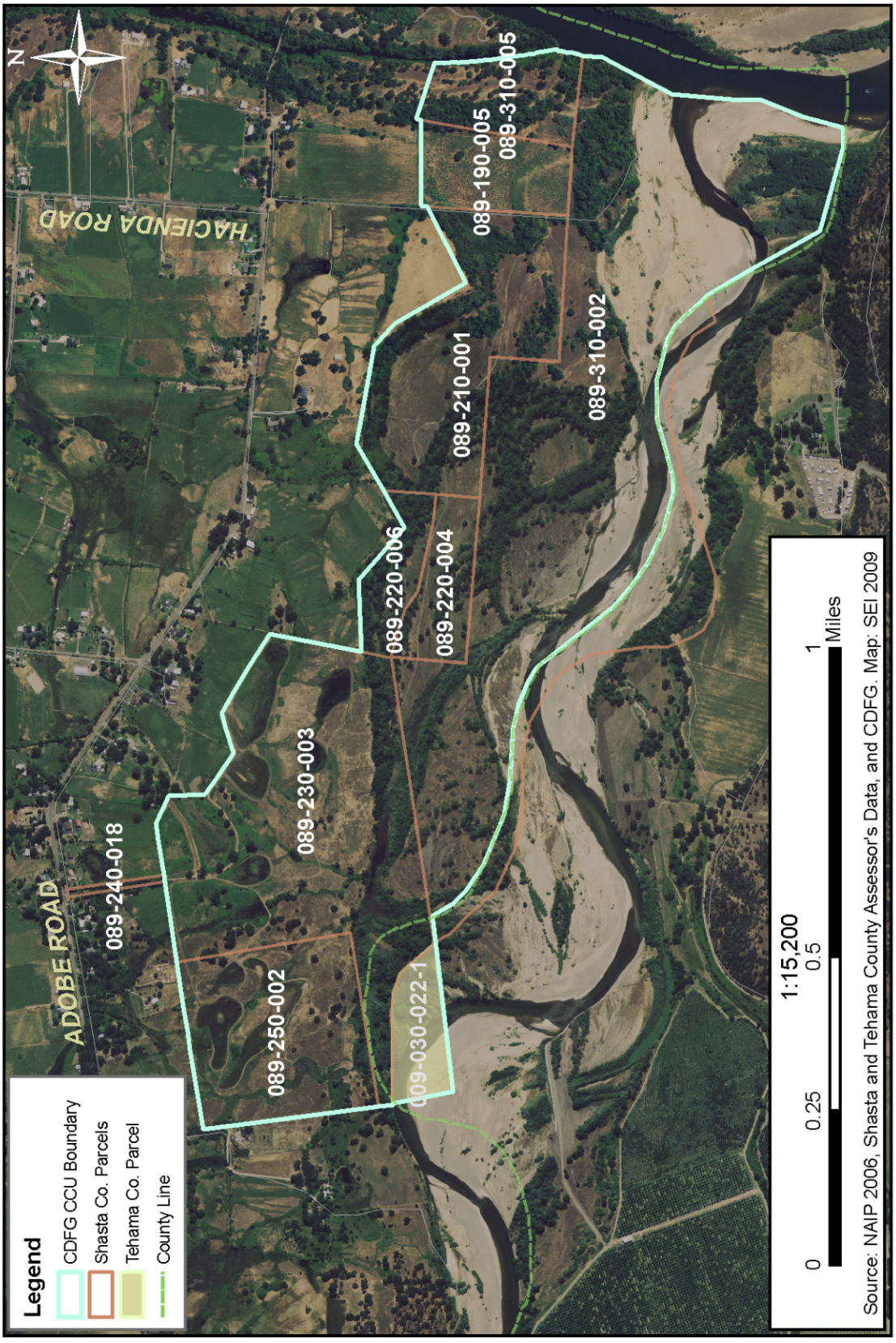


Figure II-e. Parcel Boundaries, Balls Ferry Wetland Units 1 and 2 (topographic view)

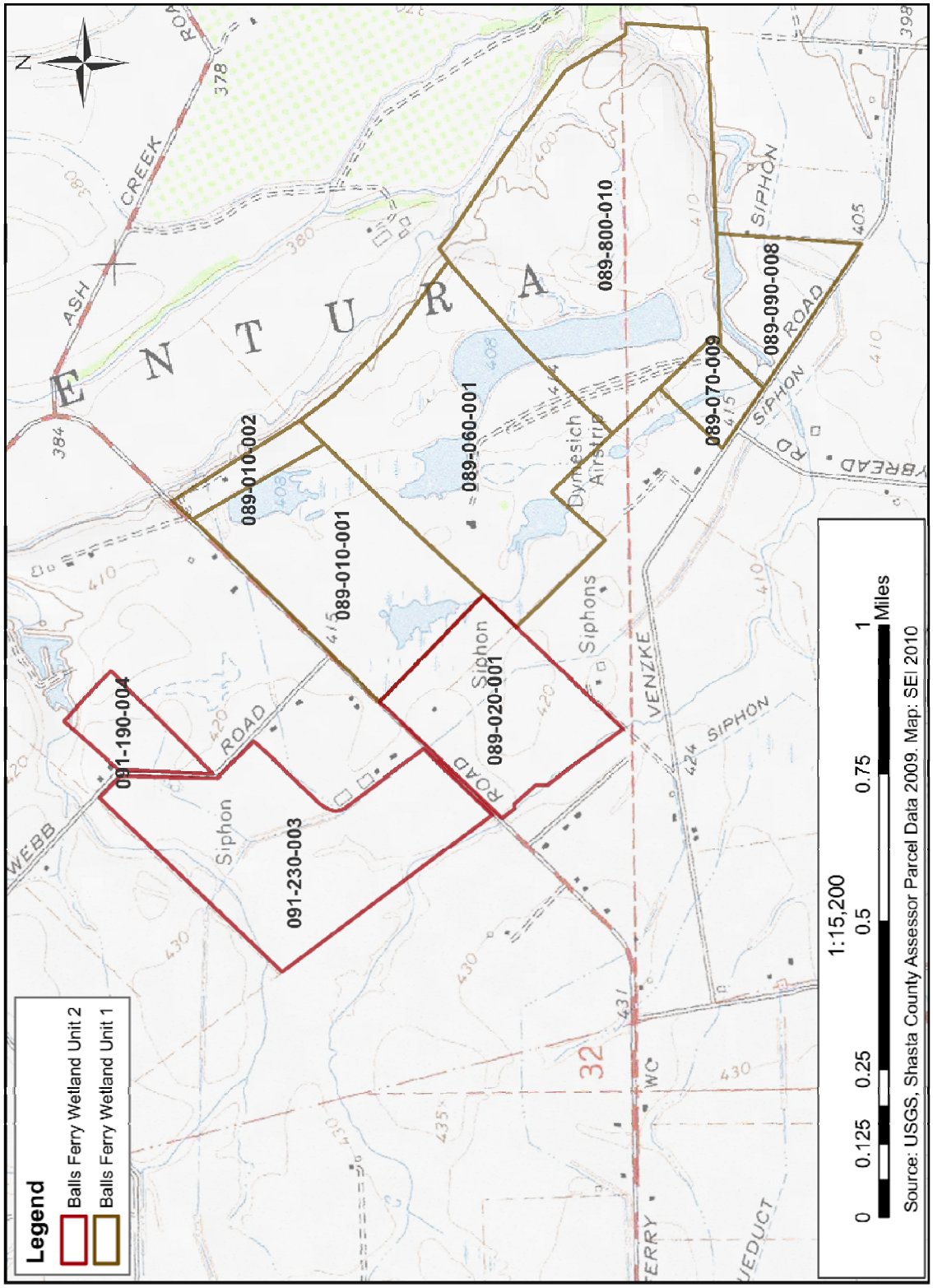
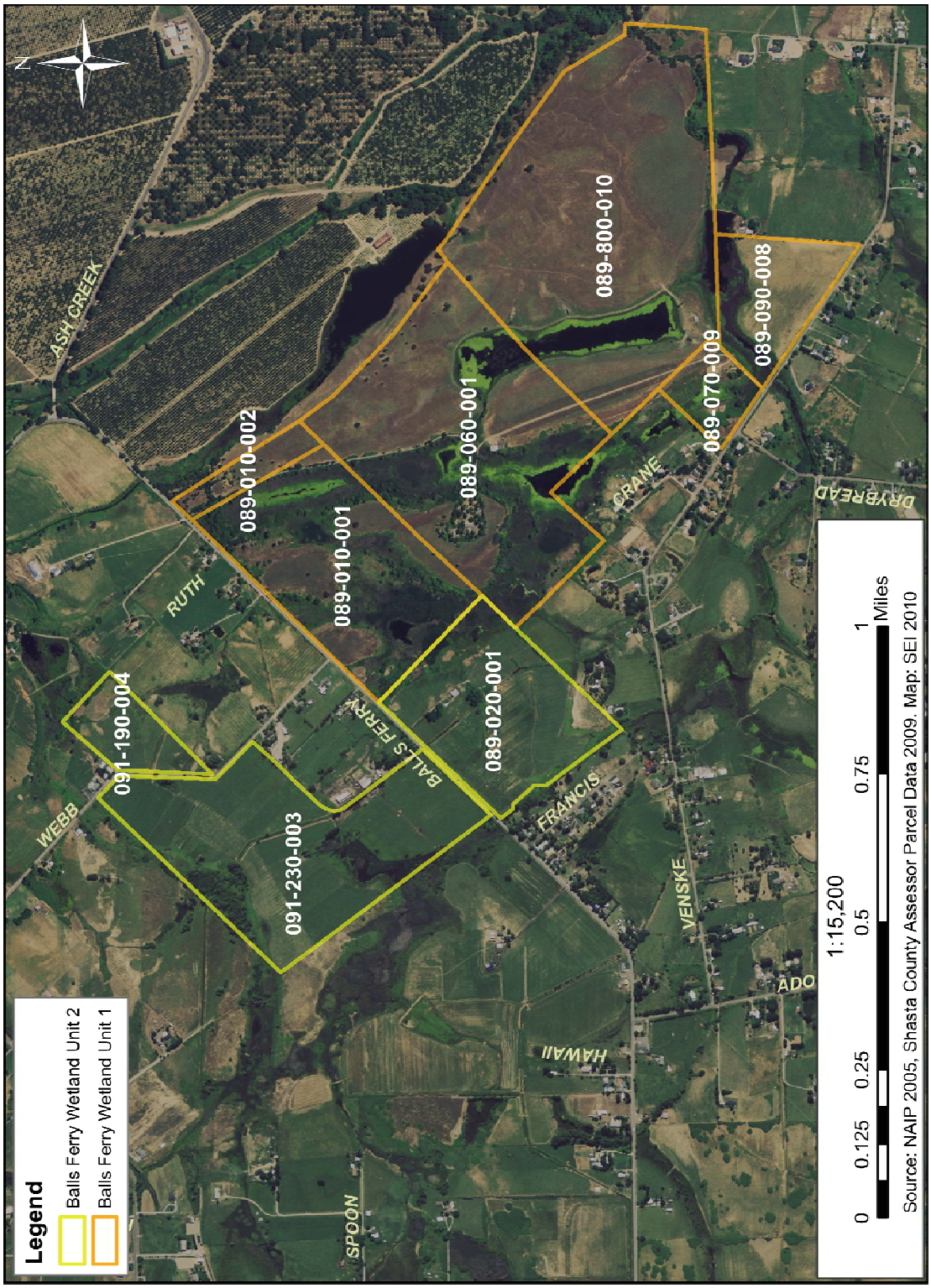


Figure II-f. Parcel Boundaries, Balls Ferry Wetland Units 1 and 2 (aerial view)



3. Easements

Easements and rights-of-way are legally recorded documents that run with the deed of the property and are transferred with the property from owner to owner. Easements typically preserve the rights of an entity other than the landowner. The MCCWA has three active easements, one from Anderson-Cottonwood Irrigation District (ACID), one from Pacific Gas and Electric (PG&E), and an easement for maintenance access on the BFW2 parcel retained by the previous owner.

Anderson-Cottonwood Irrigation District

ACID, the major water supplier in south-central Shasta County, provides irrigation water to the MCCWA. ACID has underground pipelines within the westernmost road access to the Cottonwood Creek Unit and as part of the easement agreement, maintains the roadway (S. Arrison, CDFG retired, personal communication). The ACID Lateral #33 bisects the BFW2 along with three underground irrigation pipelines, and provides water to BFW1. The terms of the easements were not available (S. Wangberg, ACID, personal communication).

Pacific Gas and Electric

PG&E holds an easement through the southern part of the BFW2 and the southeastern portion of the Cottonwood Creek Unit to allow for placement and necessary maintenance of the electric transmission line through the unit (Appendix A). Per the terms of the easement, management activities in and near the PG&E easements area may not impede the use of the easement or diminish improvements paid for by PG&E.

PHOTO: At left, PG&E easement crosses entry road in the southeastern portion of the Cottonwood Creek Unit. At right, riparian restoration planting in the same area. SEI, July 2005.

C. Climate and Geology

1. Climate

Typical of its location at the northernmost end of the Sacramento Valley, the MCCWA has a Mediterranean climate with hot, dry summers and moist, cool winters. The nearest available climate data is from Redding, California, 15 miles to the north of the Wildlife Area. Redding's average annual temperature is 62°F. The average high temperature in July is 98°F and the average low is 65°F. Extended periods of temperatures above 100°F are not uncommon. In December, the average high temperature is 55°F and the average low is 35°F.

Approximately 90% of the annual precipitation occurs during the period from October through March and consists of rain; however, in the mountainous regions of the upper Sacramento River Basin, much of the seasonal precipitation occurs as snow. It is not uncommon for Redding to receive a dusting of snow during the winter. The average annual precipitation along the Sacramento River in the vicinity of the Wildlife Area is approximately 34 inches. Fog is a common winter element below 1,000 feet where winter humidity often exceeds 50%. Relative humidity in the summer is less than 30% during the day and rises to about 50% at night. Table II-b presents average monthly climatic data from Redding.

Table II-b. Temperature and Precipitation Averages, Redding, California

Month	Avg High	Avg Low	Avg Precip	Record High	Record Low
January	55.3° F	35.7° F	6.1 in	77° F (01/17/1994)	19° F (01/14/1997)
February	61.3° F	40.0° F	4.5 in	83° F (02/25/1992)	21° F (02/05/1989)
March	62.5° F	41.7° F	4.4 in	85° F (03/26/1988)	28° F (03/05/1997)
April	69.9° F	46.0° F	2.1 in	94° F (04/09/1989)	31° F (04/01/1999)
May	80.5° F	52.3° F	1.3 in	104° F (05/06/1987)	36° F (05/04/1999)
June	90.4° F	61.8° F	0.6 in	111° F (06/26/1987)	42° F (06/01/1990)
July	98.3° F	64.7° F	0.2 in	118° F (07/20/1988)	54° F (07/21/1999)
August	95.7° F	63.1° F	0.5 in	115° F (08/06/1990)	51° F (08/28/1995)
September	89.3° F	58.8° F	0.9 in	116° F (09/03/1988)	46° F (09/24/1993)
October	77.6° F	49.2° F	2.2 in	105° F (10/11/1991)	33° F (10/31/1989)
November	62.1° F	41.4° F	5.2 in	88° F (11/13/1995)	23° F (11/23/1993)
December	54.7° F	35.2° F	5.5 in	78° F (12/16/1998)	17° F (12/21/1990)

Source: Redding Central 2008

2. Soils

The MCCWA is underlain primarily by five loamy soil types: Moda, Perkins, Newtown, Churn and Reiff series. Moda and Perkins loams meet the criteria for farmland of statewide importance (California Department of Conservation 2005). Loam soils are composed of sand, silt, and clay in relatively even concentrations. They are gritty, plastic when moist, and retain water easily, yet they drain well where the topography allows. Loam soils generally contain more nutrients than sandy soils. In Shasta County these soils are typically found along the Sacramento River floodplain and alluvial plains associated with level to gentle slopes ranging from 0 to 9%.

Moda. The Moda soils occur on nearly level old terraces under annual grass and forb vegetation. The underlying alluvium is derived from a wide variety of rock formations. Moda soils are well drained, with medium runoff, and very slow permeability below the A horizon. The soil above the hardpan is saturated at times during the rainy season and when it is irrigated. Typically, soils of this type are used for irrigated and dry pasture and for shallow rooted crops. The principal native plants are annual grasses and forbs, such as goldfields, popcornflower, brodiaea, curly dock, and hayfield tarweed (Natural Resources Conservation Service [NRCS] 2006a, b).

Perkins. The Perkins series consists of very deep, well drained soils that formed in alluvium derived from sedimentary, granitic and metamorphosed acid igneous rock. Perkins soils are on terraces with slopes ranging from 0 to 30%, but usually have slopes of less than 9%. They are well drained soils with slow to rapid runoff and moderately slow permeability. In some areas, this soil type is subject to rare or occasional flooding. In uncultivated areas, dominate plants are naturalized grasses and forbs. The principal native plants are live oak, California sagebrush, blue oak, valley oak, and shrubs (NRCS 2006a).

Newtown. The Newtown soils occur on the gently sloping to very steeply sloping old terraces of the Tuscan-Tehama sediments. They are slowly permeable, well-drained soils with medium to rapid runoff potential. Generally, Newtown soils are used for grazing; where uncultivated, native vegetation is blue oak, live oak, digger pine, manzanita, annual grasses, and forbs (ibid).

Churn. The Churn soils are formed in mixed alluvium on low level or gently sloping terraces. They tend to be well drained or moderately well drained; runoff is slow or medium and permeability is moderate to moderately slow. In cultivated areas, Churn soils are used for dry grain crops, irrigated pasture, and small areas of alfalfa, orchard, berries, and truck crops. Native vegetation includes valley oaks, annual grasses, and forbs (ibid).

Reiff. The Reiff series consists of very deep, well-drained soils formed in coarse to medium textured alluvium weathered from mixed sources. Reiff soils are located on flood plains and alluvial fans, and are level to gently sloping (slopes range from 0 to 9%). They tend to form in areas subject to occasional periods of flooding from December to April. The soil between the depths of 5 and 22 inches is dry in all parts from June to November and moist in some or all parts the rest of the time. Reiff soils are well drained with very slow to slow runoff and moderately rapid permeability. Thin silt, sand, and gravel lenses are common in the profile. Gravel content in some or all horizons ranges up to 30% but most pedons have little if any gravel. Few faint mottles occur within the profile of some pedons. Organic matter content decreases irregularly with depth. Some pedons have fine stratification below 6 inches. Reiff soils support annual grasses and forbs, such as soft chess, filaree, wild oats, mustard, and valley oak in uncultivated areas (NRCS 2006a).

Other Soil Types. Five other soil types are found on the MCCWA include Tehama silty loam (0 to 3% slopes), Anderson gravelly sandy loam, Columbian complex, channeled (0 to 5% slopes), cobbly alluvial soils, and riverwash. Tehama silty loams are found on the upper alluvial terraces and are well-drained soils that rarely flood. They support annual grassland vegetation and are used for pasture and irrigated orchard crops. Anderson loams are founds on fans, flood plains and the valley floor, sloped at elevations of 350 to 1,500 feet. They are formed in gravelly and cobbly alluvium derived from a wide variety of rock sources. When vegetated with native plants, Anderson loams support annual grasslands and forbs along with live oak and pines. All three of the remaining soil types represent variations within stream channels and their associated floodplains. Columbian complex are well-drained, silty loams underlain with gravelly sands. They are found in floodplains and are frequently inundated. Riverwash and cobbly alluviums are not specifically defined as soils by NRCS (ibid.), but are generally made up of fine silts, sands and cobbles deposited during flood events. Riverwash areas are subject to regular flooding and support little vegetation.

Location and Distribution

The soil types found on each unit of the MCCWA are summarized in Table II-c. The distribution of soil types at the Cottonwood Creek Unit and at the two Balls Ferry wetland units is depicted in Figure II-g and Figure II-h, respectively.

Table II-c. Soil Types, Mouth of Cottonwood Creek Wildlife Area

Type	Description	CCU	BFW1	BFW2
Ad	Anderson gravelly sandy loam	X		
CeB	Churn gravelly loam, 3 to 8% slopes	X		
CfA	Churn gravelly loam, deep, 0 to 3% slopes	X		
CfB	Churn gravelly loam, deep, 3 to 8% slopes	X		
Ch	Cobbly alluvial land	X		
Ck	Cobbly alluvial land, frequently flooded	X		
Cu	Columbian complex, channeled, frequently flooded*	X		
MhA	Moda loam, seeped, 0 to 3% slopes	X	X	X
MkB	Moda loam, shallow, 0 to 5% slopes	X		X
NeC	Newtown gravelly loam, 8 to 15% slopes	X	X	
NeD	Newtown gravelly loam, 15 to 30% slopes	X		
NeE2	Newtown gravelly loam, 30 to 50% slopes, eroded		X	
PlA	Perkins loam, 0 to 3% slopes	X		
PmA	Perkins gravelly loam, 1 to 3% slopes		X	X
PoA	Perkins gravelly loam, moderately deep, 0 to 3% slopes	X	X	X
PoB	Perkins gravelly loam, moderately deep, 3 to 8% slope	X	X	X
RhA	Reiff fine sandy loam, deep, 0 to 3% slopes	X		
RkA	Reiff gravelly fine sandy loam, deep, 0 to 3% slopes	X		
RlA	Reiff loam, 0 to 3% slopes	X		
Rw	Riverwash*	X		
TbA	Tehama silt loam, 0 to 3% slope		X	
W	Water	X	X	X
Wa	Wet alluvial land	X		X

* Similar soil types; identified differently in soil databases from Shasta County and Tehama County.
CCU = Cottonwood Creek Unit; BFW1 = Balls Ferry Wetlands Unit 1; BFW2=Balls Ferry Wetlands Unit 2
SOURCE: NRCS 2006a

Figure II-g. Soil Types, Cottonwood Creek Unit

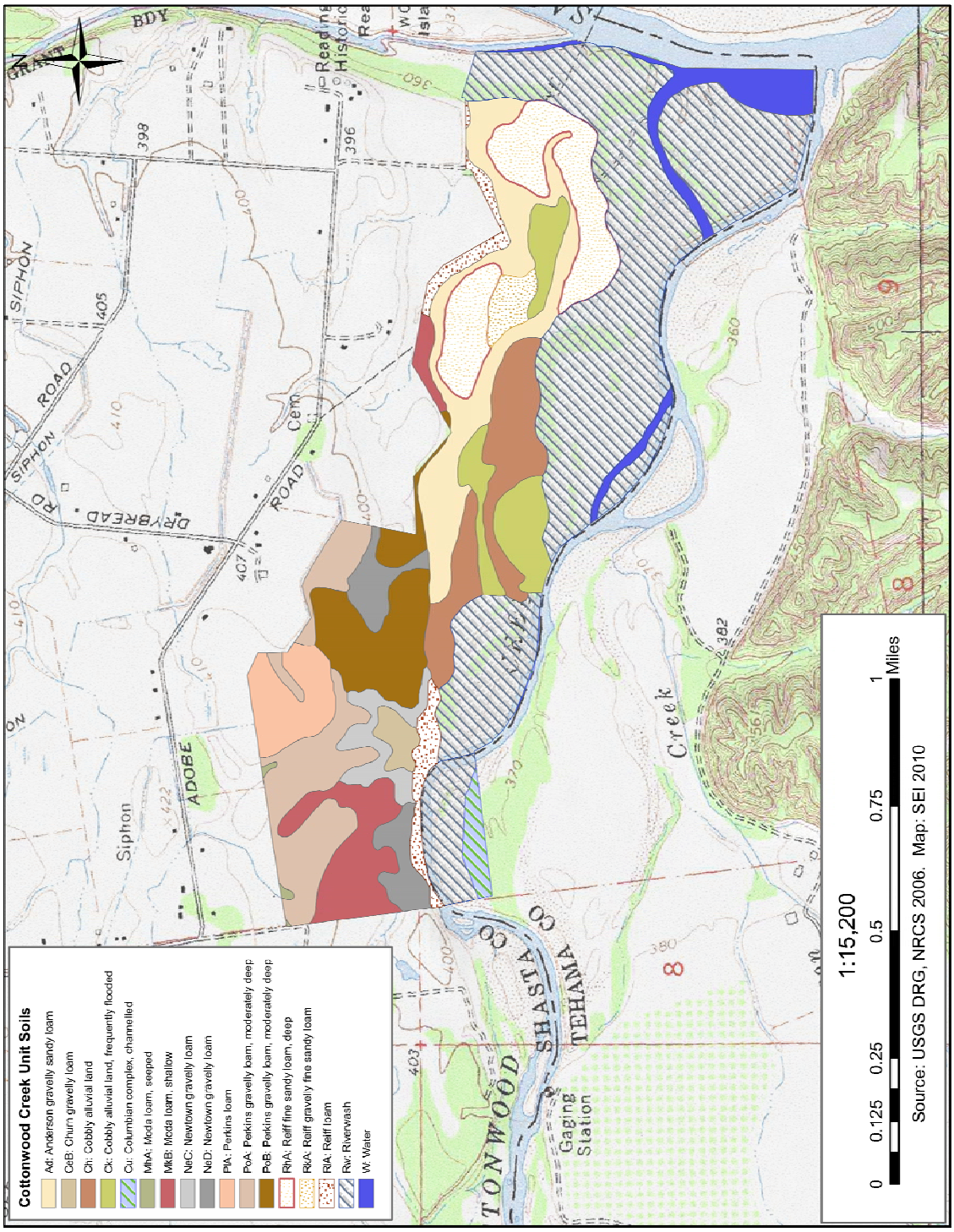
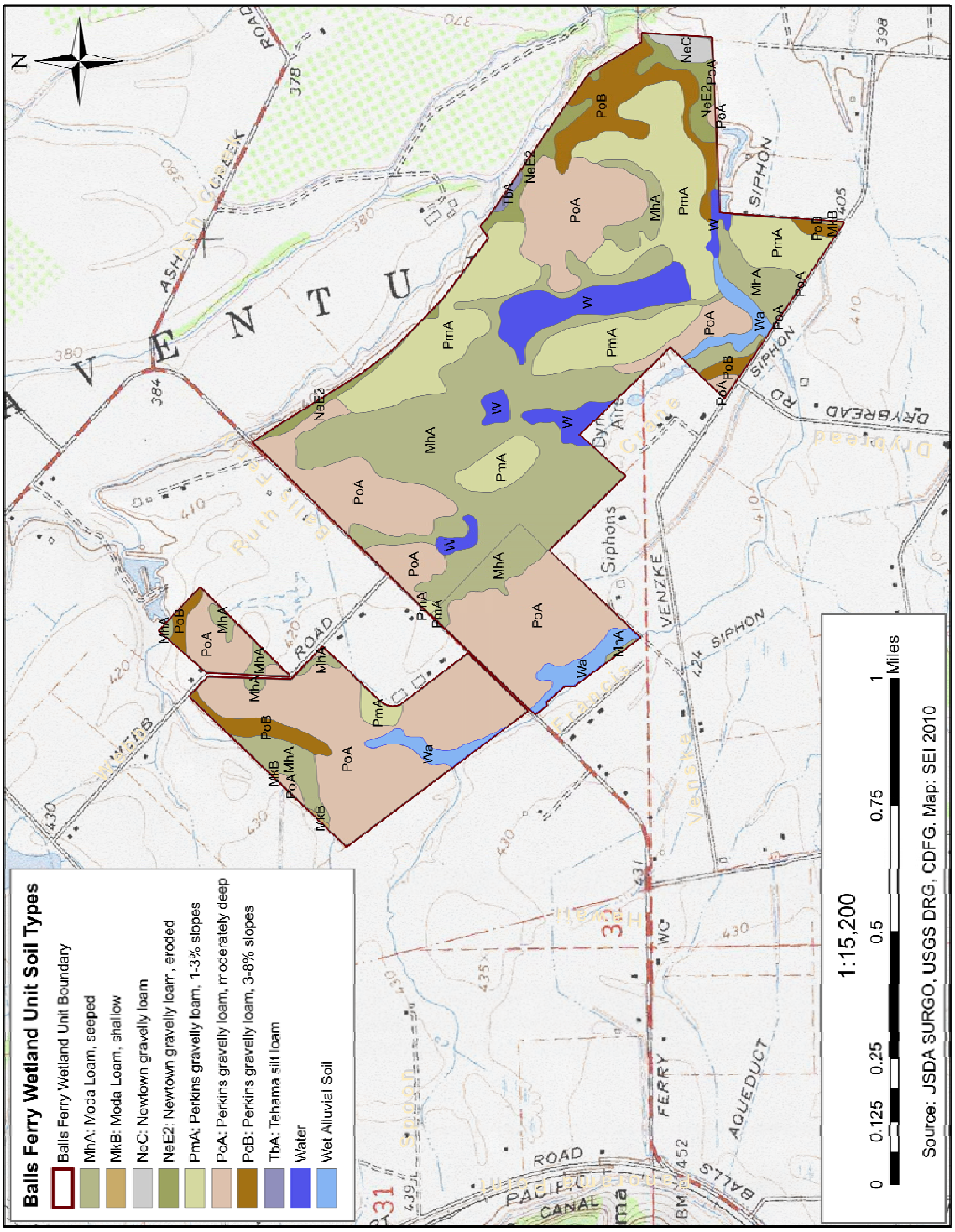
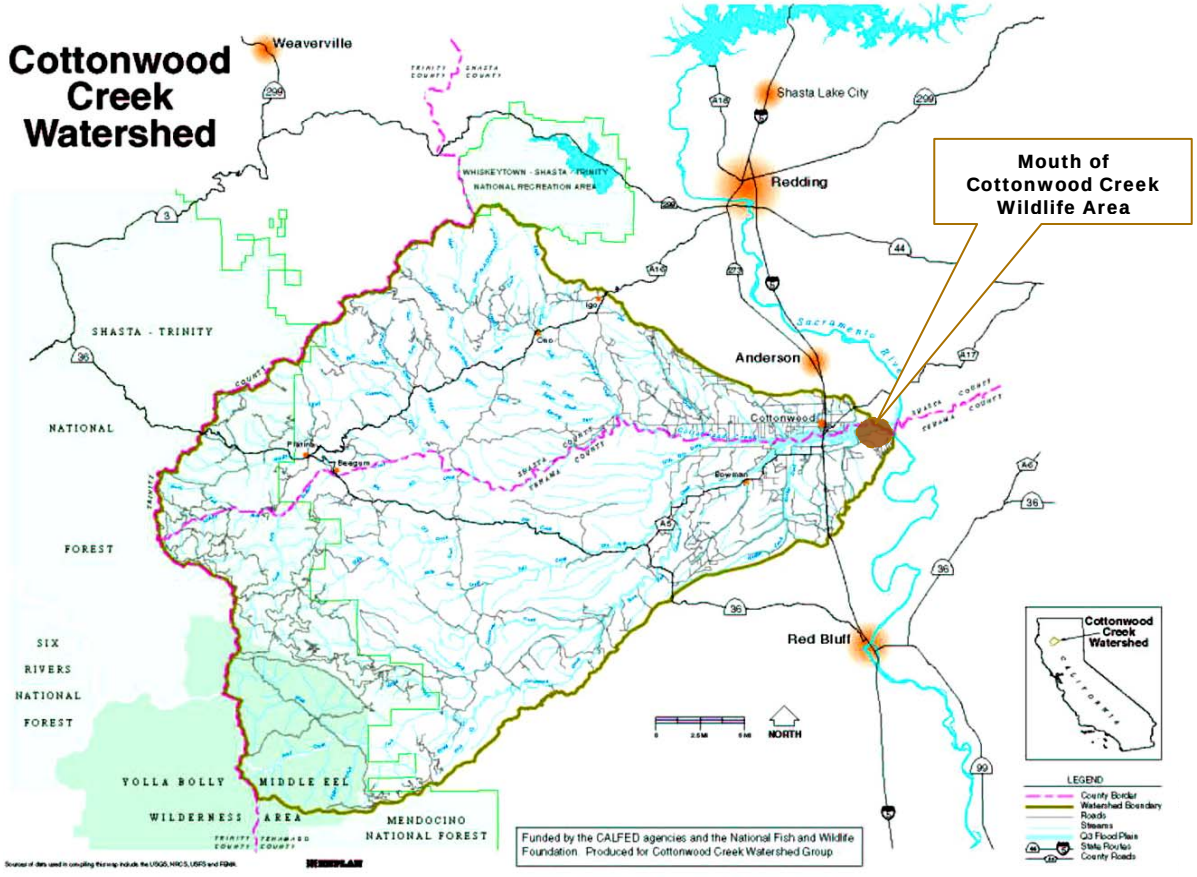


Figure II-h. Soil Types, Balls Ferry Wetland Units 1 and 2



3. Hydrology

As discussed previously, the MCCWA lies within the lowermost portion of the Cottonwood Creek watershed. The Cottonwood Creek Unit, situated at the creek's confluence with the Sacramento River, is entirely within the 100-year floodplain. The Balls Ferry wetland units, both located 60 to 70 feet higher than the mouth of Cottonwood Creek and less than a mile north, are unique in the region for their concentration of natural and artificial impoundments and freshwater wetland habitats.



A hydrological assessment of Cottonwood Creek (Graham Matthews & Associates 2003) showed that it drains a basin of about 927 square miles upstream from the USGS gaging station located near Cottonwood at river mile 2.8 (a short distance, and virtually no change in drainage area, above its confluence with the Sacramento River). The watershed rises to over 8,000 feet at the crest of the Coast Ranges, which separates Shasta and Tehama counties from Trinity County. The entire watershed is essentially unregulated, although a small reservoir, Rainbow Lake (4,800 acre feet capacity), is located on the north fork of Cottonwood Creek. As the largest undammed tributary in the northern Central Valley, it provides almost 85% of the gravel introduced between the towns of Redding and Red Bluff and provides the primary gravel source for salmonid spawning habitat along the Sacramento River (CH2MHill 2002).

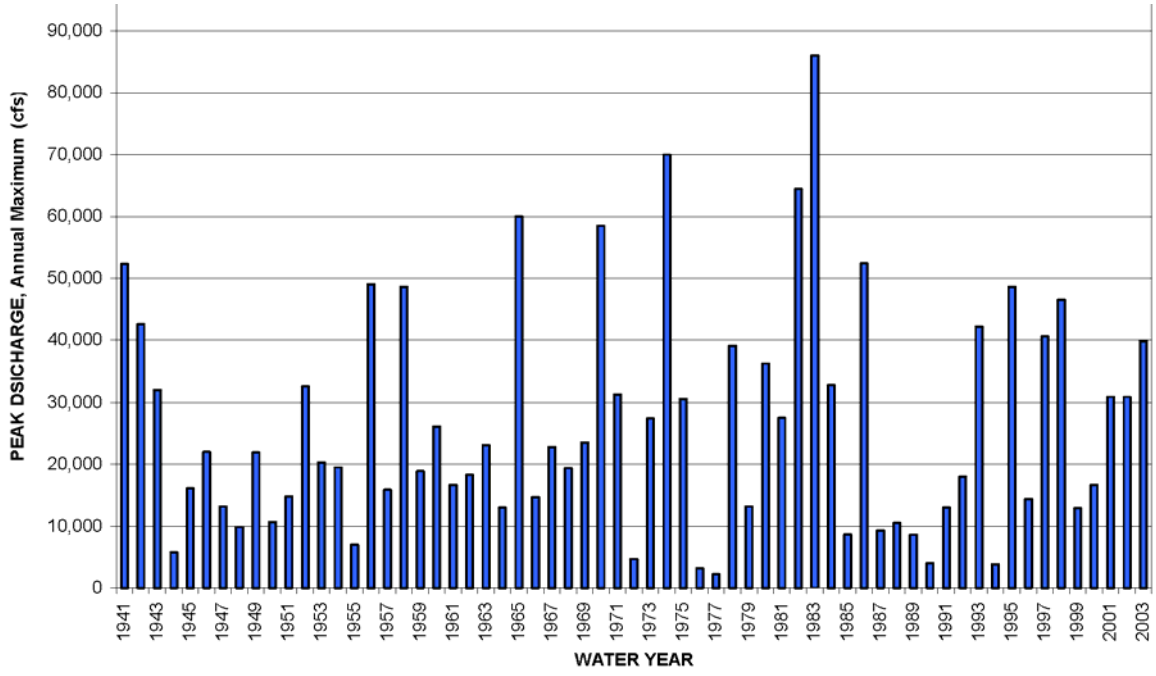
Normal annual precipitation for the entire Cottonwood Creek watershed has been estimated by the U.S. Army Corps of Engineers at 36.3 inches (Graham Matthews & Associates 2003). As is

typical of California, precipitation in the Cottonwood Creek watershed is highly seasonal with about 90% falling between October and April. A small portion of the annual precipitation falls as snow at the higher elevations in the upper watershed; snowmelt runoff is not a major component of the streamflow in the watershed. Occasional rain-on-snow events, however, can contribute significantly to the production of large floods. Annual precipitation rates in the watershed range from about 25 inches at the confluence with the Sacramento River to over 50 inches in the headwaters of the watershed along the crest of the Yolla Bolly Mountains.

Annual runoff has been measured in the Cottonwood Creek watershed at the USGS streamflow gage since October 1940 (ibid.). The mean annual runoff for the 1941-2000 period is 645,000 acre feet for Cottonwood Creek. Flows in Cottonwood Creek are less than 230 cubic feet per second (cfs) 50% of the time, and exceed 2,000 cfs only 10% of the time, or 36 days per year on average. Relatively little sediment transport is likely to occur below 10,000 cfs; thus, all of the geomorphic work accomplished by the creek occurs during less than 5% of the year with most concentrated in the top 1% of the flows.

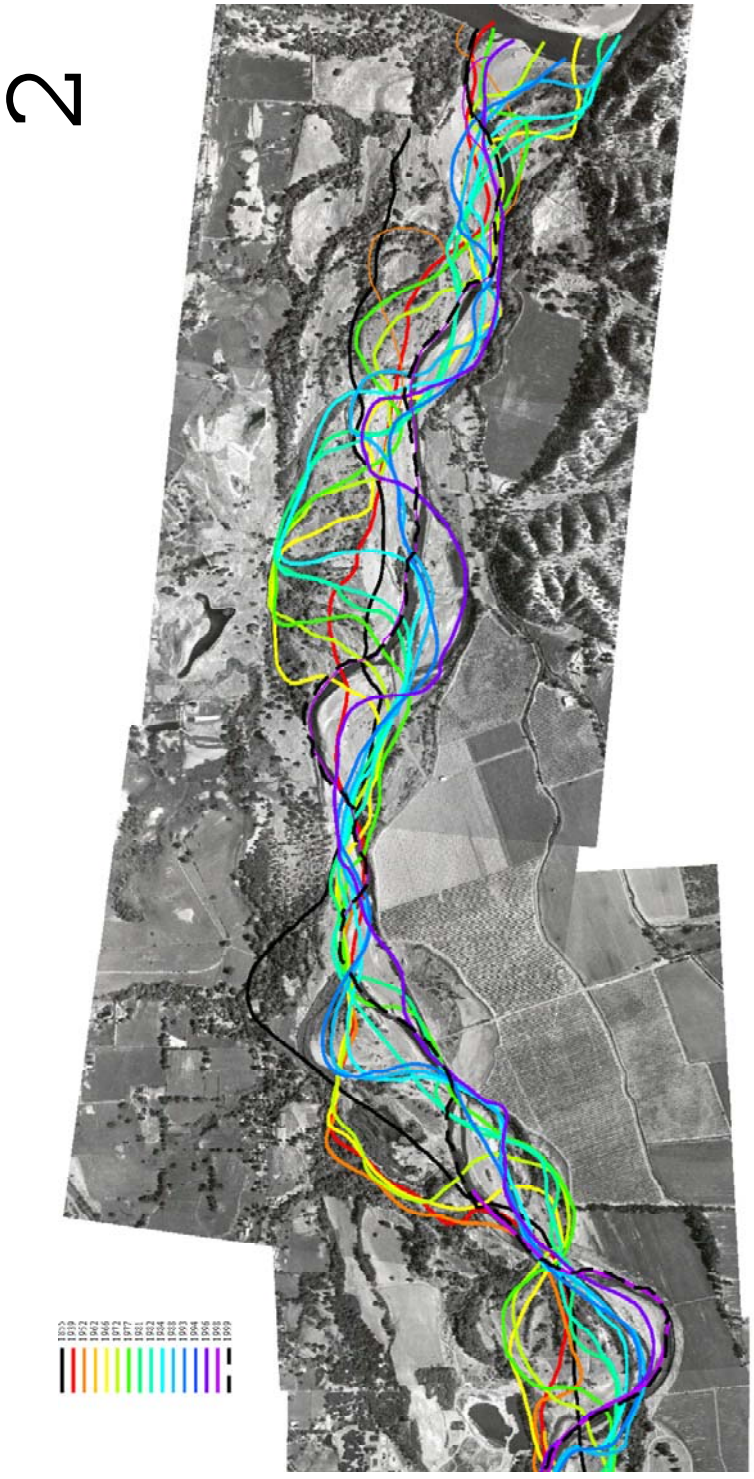
Peak annual discharges recorded since 1941 are highly variable, ranging from a minimum of 2,210 cfs during the drought of 1976-77 to maximum of 86,000 cfs in 1983 (Figure II-i). When USGS gaging records for the Sacramento River at Bend Bridge near Red Bluff are added along with historical data, the evidence suggests that the largest flood events occurred in 1862, 1890, 1937, 1940, and 1983. A map of the major channel realignments of Cottonwood Creek from 1855 to 1999 shows just how much the channel has shifted, even since CDFG initially acquired the property in 1981 (Figure II-j). Aerial photos of lower Cottonwood Creek taken between 1939 and1999 further illustrate these channel shifts (Figure II-k).

Figure II-i. Annual Maximum Peak Discharges of Cottonwood Creek near Cottonwood, California (USGS Gage #11376000), 1941-2003



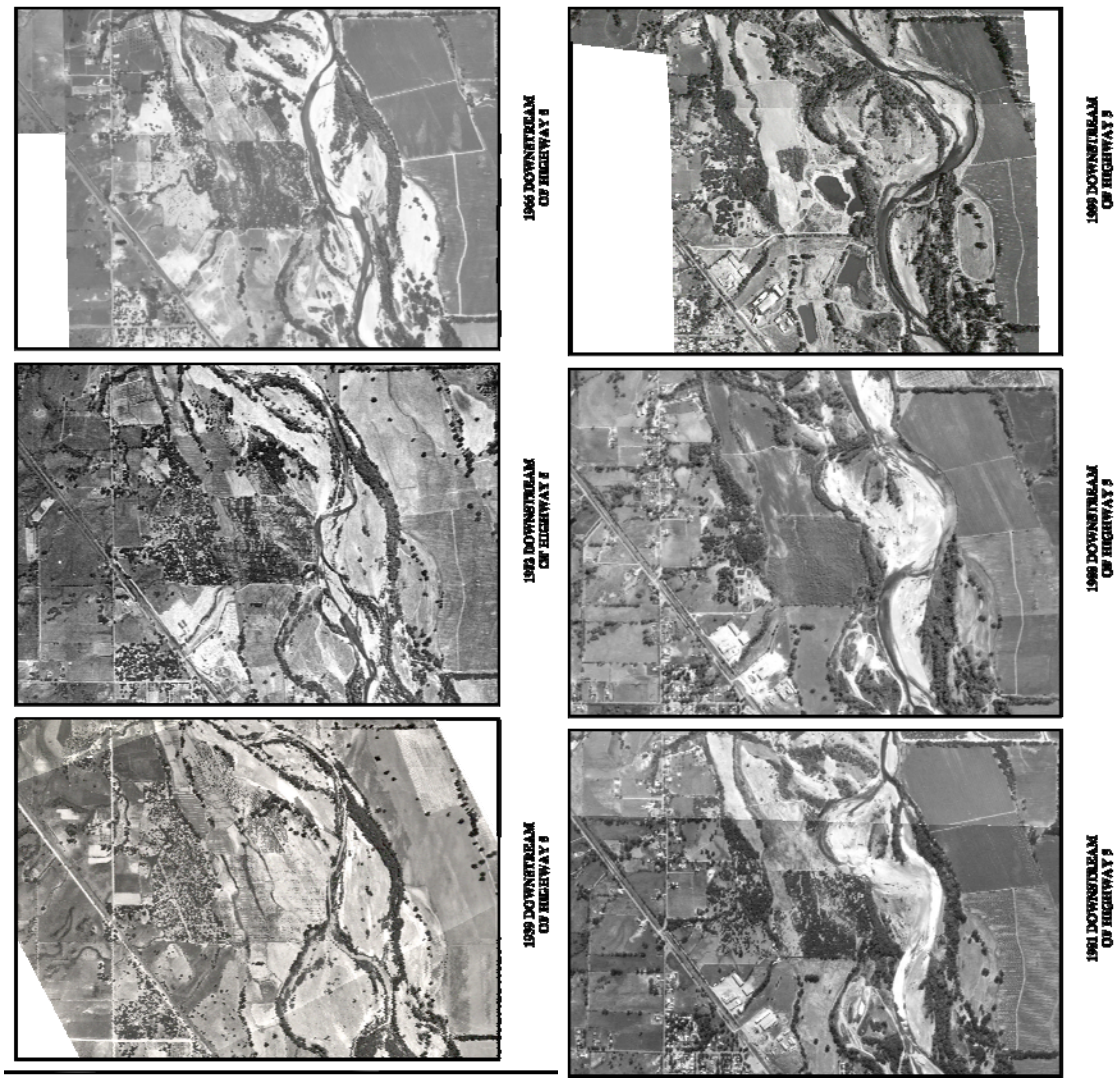
SOURCE: Cottonwood Creek Geomorphic Study (CalFed Project No. 97-N07), Graham Matthews & Associates, 2003

Figure II-j. Major Channel Alignments, Lower Cottonwood Creek between Interstate 5 and the Sacramento River, 1855-1999



SOURCE: Cottonwood Creek Geomorphic Study (CalFed Project No. 97-N07), Graham Matthews & Associates, 2003

Figure II-k. Aerial Photo Comparison of Lower Cottonwood Creek between Interstate 5 and the Sacramento River, 1939–1999



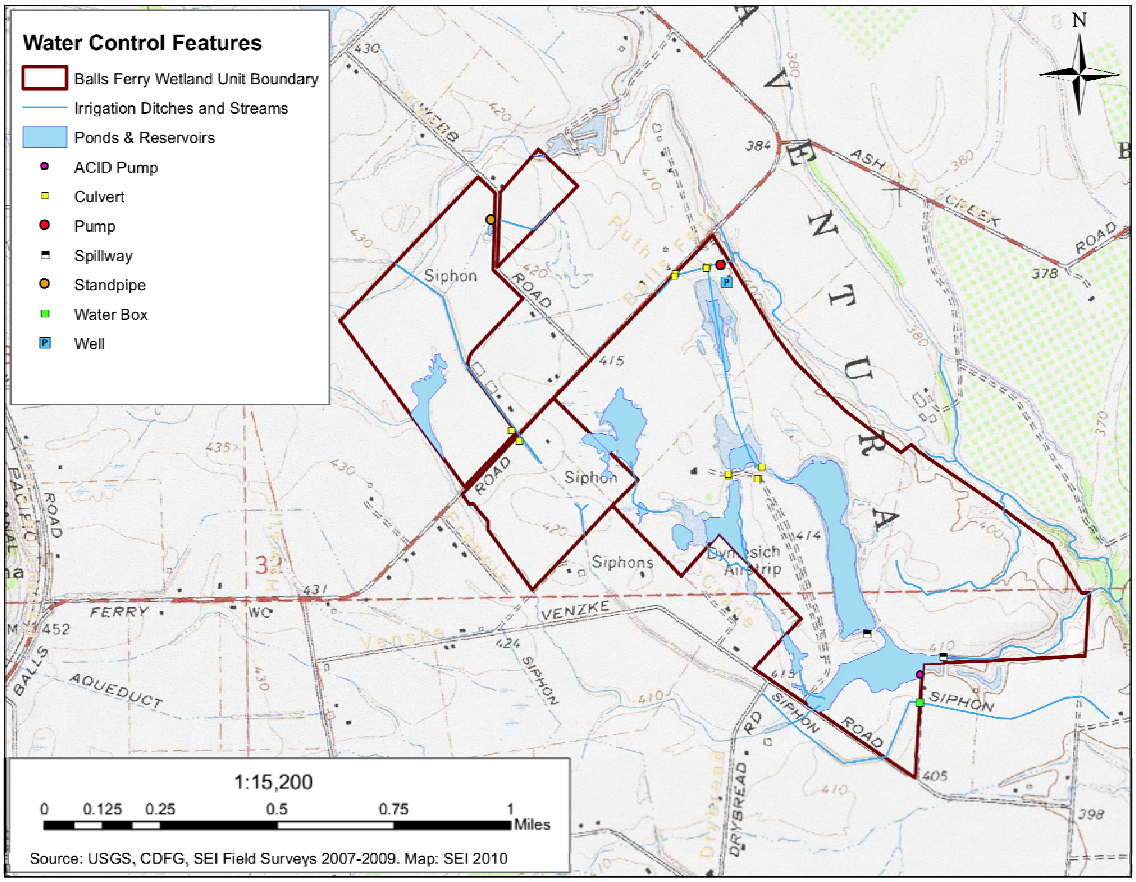
SOURCE: Cottonwood Creek Geomorphic Study (CalFed Project No. 97-N07), Graham Matthews & Associates, 2003

Water Conveyance

The Anderson-Cottonwood Irrigation District (ACID) provides water to the MCCWA (all three units) through a series of irrigation ditches and pumps. The ACID draws water from the Sacramento River north of Redding and delivers it to southern Shasta County via a system of earthen channels. The Cottonwood Creek Unit is supplied by ACID Lateral #37. In 2006, ACID provided water for 19.5 acres of the Cottonwood Creek Unit, primarily for the Cottonwood Wetland Mitigation Bank which is contained within the unit but is managed separately (Wangberg, personal communication).

BFW1 draws from two water sources, the Dymesich pond pumps and ACID Lateral #33. In 2006, the ACID provided water for 46 acres of the BFW1 (primarily for irrigated pasture and ponds). BFW2 is supplied water through ACID Lateral #33 and three underground irrigation pipes. Figure II-l shows the location of water conveyance structures on both Balls Ferry wetland units.

Figure II-l. Water Conveyance, Balls Ferry Wetlands Units 1 and 2



Water Deliveries. ACID water deliveries are billed annually, in advance, by the number of acres irrigated with the assumption that each 5 cfs will irrigate one acre per hour. Users are allotted a specific number of hours during which water is provided based on the flow measured at the delivery point and the number of acres to be irrigated. Each customer receives water in turn approximately every two weeks throughout the irrigation season. For example, if the customer applies for water on 100 acres and the delivery flow is 20 cfs, water will be provided for 25 hours during each two-week rotation (20 cfs = 4 acres per hour) (Wangberg, personal communication).

D. Cultural History

Previous archaeological work within the MCCWA is limited to two project-specific archaeological surveys within the boundaries of the Cottonwood Creek Unit. In 1993, archaeological surveys were conducted on a portion of the Cottonwood Creek Unit as part of a wetlands mitigation program co-managed by Caltrans (Bennet 1993). The following year Hamusek (1994) conducted a survey of a portion of the property for a parking lot to be developed by CDFG. The acreage covered was not specified. Hamusek identified two isolated prehistoric artifacts: a single "metavolcanic core reduction flake" and an "edge-modified basalt coble core tool." She suggested that as isolates the objects were not eligible for the National Register of Historic Places (NRHP) and recommended that the project move forward with no further restrictions. Hamusek reported ground visibility at 90%, indicating that the need to resurvey this area is low (1994). No focused archaeological surveys have been conducted on either of the Balls Ferry Units.

In 2006, archaeologists conducted reconnaissance-level surveys of both the Cottonwood Creek Unit and the BFW1 (S. Baxter, unpublished report for SEI). This effort was repeated in 2009 on the BFW2 (S. Baxter, unpublished report for SEI). The purpose of these investigations was to observe the landscape in the context of known cultural components of the area in preparation of this document. Additional documentation has been compiled through literature reviews and archaeological records searches (Northeast Information Center 2007, 2009).

1. Pre-European History

Four distinct phases of human occupation have been defined for the region in which the Mouth of Cottonwood Creek Wildlife Area is located. The earliest known prehistoric occupation dates back to circa 6000 BC.

Early Archaic Period (6000 BC to 3000 BC) Villages at this time were small to medium in size, and were situated along streams in the foothill areas. Most cultural resource artifacts recovered that are associated with this period relate to hunting and food gathering. Projectile points were large in size and wide stemmed, probably used with throwing sticks commonly called atlatls, or spears. Manos and metates (tools for grinding grain) were introduced during this time, indicating the use of seeds as food (Hamusek 1994).

Middle Archaic Period (3000 BC to 500 BC) Settlement patterns did not change during this time, but the material culture became more elaborate, and projectile points were generally reduced in size (ibid).

Transitional Period (500 BC to AD 500) Settlement patterns changed during the transitional period. Villages moved from the foothills to the valley floor and were located along major river systems. Projectile points were characterized by medium-sized side and corner-notched points. Mortars and pestles were introduced during this time, indicating that acorns were used as a food source (ibid).

Shasta Complex (AD 500 – AD 1800) Settlement patterns shifted to larger villages with smaller encampments near favored food sources. During this time projectile points became even smaller, indicating the introduction of the bow and arrow. Hopper mortars also came into use. Acorn and salmon were the primary food sources. It has been argued that the Shasta complex is the

archaeological manifestation of the Wintu people, indicating their relatively late arrival to the area (Hamusek 1994).

Moratto (1984) noted the surprising lack of early sites in California's Central Valley when in contrast there are sites known to be 7,500 to 11,500 years old in the nearby coast range. Moratto points out that there has been as much as 10 meters of soil deposition in the valley over the last 6,000 years, an action that would effectively cap earlier sites. It is likely that there are sites older than 6000 BC that have not been located due to their greater depth.

2. Pre-European Ethnography

The Mouth of Cottonwood Creek Wildlife Area is situated on land ethnographically occupied by the Wintu. The Wintu were the northernmost of five Penutian-speaking groups that occupied different parts of the Sacramento Valley (Moratto 1984). The Wintu territory covered portions of Shasta, Siskiyou, Trinity and Tehama counties. The Wintu were divided into nine major groups, named by their geographic locations. Nearby neighbors of the Wintu were the Central Yana on the east side of the Sacramento River and the Nomlaki on the south side of Cottonwood Creek.

PHOTO: Bark house, 1924. Phoebe Hearst Museum.

The Wintu lived in conical structures constructed of poles and peeled bark or pine boughs, a house type common throughout the Sacramento Valley and foothills. Villages generally had between four to seven houses, with a typical population of 20 to 150 people. Larger villages (50 or more people) often had a lodge for men's gatherings and spiritual ceremonies. These were 15 to 20 feet in diameter, semi-subterranean, and covered with a roof bark or pine boughs supported by poles. A central opening in the roof served as both an entrance and smoke hole (LaPena 1978). The main villages were generally situated on low knolls near streams or permanent waterways (Moratto 1984), but three types of settlements were identified ethnographically: winter or main villages, hunting camps, and kill sites. The latter two were small, temporarily occupied camps, situated upcountry and away from the waterways (Hamusek 1994).

Individual families formed basic economic, political and social units, with the village forming the largest political unit. A "chief" was the leader of the village. His position was inherited through patrilineal lines, although the village retained the right of refusal if the heir was deemed unfit for the position. The chief lived off of the contributions of the others in the village. He was expected to mediate disputes within the village and maintain relations with other village leaders. Inter-village disputes were apparently rare, occasioned by formalized warfare in which few casualties were incurred (LaPena 1978).

The Wintu subsisted largely on acorns, fishing, and hunting. They hunted a wide variety of animals. Both individuals and groups hunted deer. Group hunts usually involved a team of people loudly traversing the countryside, driving the deer ahead of them into a canyon or other natural

bottleneck, where the best marksmen waited with bow and arrow to shoot the animal. Black bear were hunted in the fall when they were fat and sluggish. Hunters would smoke the bear out of its lair and shoot it. Small game, including quail and rabbits, were hunted by driving the animals into nets. Hunters used snares and deadfalls to catch mice, gophers, squirrels, and other rodents. These small animals were eaten by singeing off the hair, gutting them, roasting or boiling them, then drying and pounding them into a meal. Insects such as grasshoppers and salmon flies were also collected and eaten (LaPena 1978).

PHOTO: S. W. Indian man holding bow and arrow. CD Id Number: 33. CD Frame Number: 83. Shasta Historical Society Photo Database.

In the Cottonwood Creek area, fishing was of the utmost importance. The catch was predominately Chinook salmon, ranging in size from 20 to 70 pounds, with a spring run from mid-May to October and a fall run from mid-October to December. Fishing was often done communally at night. One man would hold a torch and another held a dip net. Fishing was also done individually using harpoons. A pair of poles were lashed together in a cross and set out in deep water. A log was then laid from the shore to the cross, where a small hut was sometimes built. The fisherman then sat in the hut and speared fish as they swam past. Fall run salmon were sun dried for winter use. Spring run salmon were too oily to dry out, so they were first baked, then de-boned and flaked, dried, and finally pounded into meal. The heads, bones and entrails were dried and pounded into flour. Dried roe and pine nuts were mixed into the flour. Wintu fishermen also caught steelhead and sucker fish although they were only of secondary importance. These fish were speared, poisoned, or caught with hook and line (LaPena 1978).

PHOTO: Mano and metate, acorns. Indian Relics

The acorn was probably the most important and widely used food source among California Native Americans. Many of the lowland groups moved up into the foothills during the summer or fall to collect acorns (Moratto 1984), Gathering acorns was a family affair. Men climbed the trees and shook the acorns loose, sometimes using hooked sticks to shake the branches. Women collected the acorns in burden baskets. Gatherers worked one tree at a time; one large tree or two small ones comprised a day's work. Women pounded the acorns into a flour or meal in a mortar. This meal could then be used to make soups or breads. For making bread, the black oak or valley acorn was preferred. After it had been pounded into flour, the meal was leached in a sand pit to remove the tannic acid. A fire was built in a rock lined pit which was kept burning for a day. When hot

enough, the fire was removed and the dough placed inside. It was then covered with leaves and soil, and another fire built over it for another day. When done, the bread would keep for months, although baking was generally done once a week. Acorns were stored in bark-lined pits or in above-ground granaries that were formed from a shrub. Other important plant foods included buckeye, manzanita, Indian potato, pussy's ear, pine nuts, wild grapes, miners' lettuce, clover, hazel nut, and snakeshead (LaPena 1978).

Technologically, the Wintu were similar to most California tribes in that they lacked ceramics and instead used intricately constructed baskets for cooking, carrying and storage. Plant materials gathered to construct baskets included hazel, skunk bush, poison oak, *Xerophyllum* grass, maiden hair, pine root, grapevine, redbud, and willow. Cordage and nets were also widely used. Hunting was accomplished with sinew-backed bows of yew wood and composite-construction, obsidian-tipped arrows. Fishing was done largely with 10- to 20-foot-long wood-tipped harpoons. The Wintu used either mortar and pestle or mano and metate to process plant foods. Hopper mortars were introduced at a late date. Some older bedrock mortar locations were considered to be holy places. Water craft were limited to simple rafts and were used for transporting supplies. Clothing was minimal. Men were generally naked except for a belt of human hair or porcupine quills, although they sometimes wore a hide breechcloth. Girls were also unclothed until adolescence, after which they wore a shredded maple-bark apron or skirt that hung just below the knees. In colder weather, both sexes wore capes of deer hide or woven rabbit skins. Adornment included a range of feather, fur, or basket head gear, nose and ear piercings, facial tattoos, and beads (LaPena 1978).

PHOTO: Intricately constructed baskets were used for cooking, storage and carrying. Phoebe A. Hearst Museum.

Similar to the other Central Valley groups, the malaria epidemic of 1833 devastated the Wintu. An estimated 75% of the indigenous valley people had perished by 1846. The impact of the Gold Rush decimated most of the remaining populations (Moratto 1984).

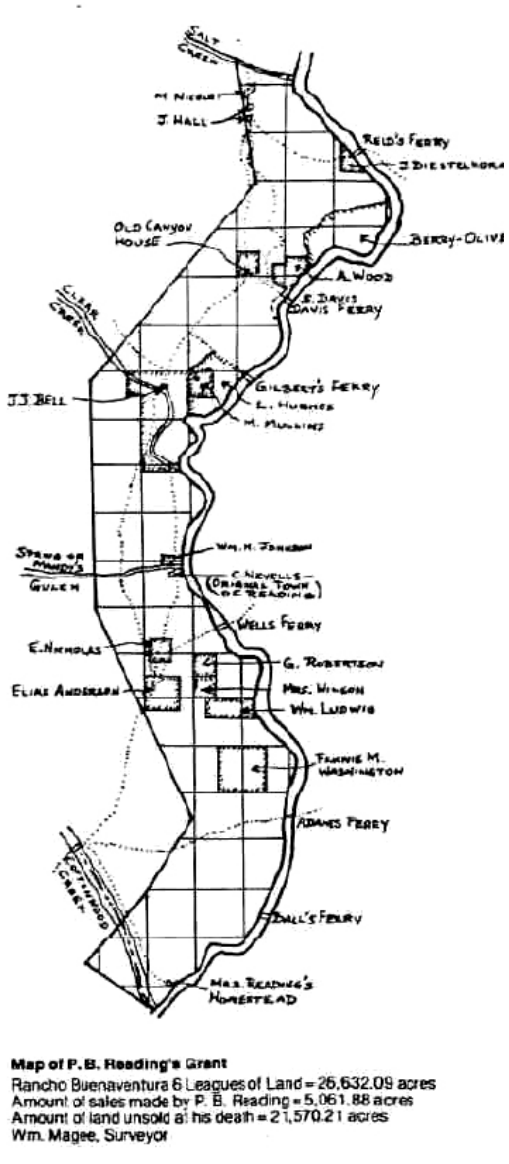
3. Post-European History

In the late 1820s and 1830s, a series of trappers moved through the area including parties led by Jedediah Smith, Alexander McLeod, Peter Ogden, and John Work (Shepherd 2002a). They were in search of furs and stayed only long enough to trap what they needed and move on. In the 1840s, the U.S. government sent John C. Fremont on a series of exploratory missions of the western frontier, including the Mexican province of California. The Mexican governor of the province was not entirely comfortable with a U.S. military presence in his territory, and directed Fremont to leave. On his way out of the territory, Fremont passed through the area and gave Cottonwood Creek its name (Shepherd 2002b).

The first permanent settlements by non-native people began with Mexican land grants in the 1840s. All three units of the MCCWA fall within the confines of the Mexican land grant known as Rancho Buena Ventura (Figure II-m). In August 1845, Mexican Governor Micheltoreña granted Rancho Buena Ventura (Rancho San Buenaventura) to Pierson B. Reading. This was northernmost of all of the Mexican period land grants.

A native of New Jersey, Reading came west with the Chiles-Walker party in 1843. He arrived at Sutter's Fort on November 10 and worked for Sutter as clerk and chief of trappers until given the land grant (Robinson 1948, Hamusek 1994). Rancho Buena Ventura included 26,632 acres of land situated on the west side of the Sacramento River. It continued to a point three miles west of the river and from Cottonwood Creek north 19 miles to Salt Creek. Reading built an adobe house for his overseer in the late summer of 1845 and then moved cattle onto the land. Shortly after its completion, Indians attacked and burned the house. Reading was absent at the time as he was working in Sacramento. In 1847, Reading built another adobe house on the rancho near the confluence of Cottonwood Creek and the Sacramento River. It was a four-room structure that later became known as "Reading's Mansion." Reading also planted crops, including cotton, grapes, olives, pears, grain, and vegetables (Hamusek 1994).

Figure II-m. Map of the Mexican Land Grant to P. B. Reading, Rancho Buena Ventura



SOURCE: Cottonwood Community Library (obtained from the California Secretary of State). Accessed online at: http://www.geocities.com/cott1388/pr-map.jpg

War came in 1846 and, although Reading (and John Sutter) had remained staunch supporters of Governor Micheltoreña, he was forced out by his Mexican adversaries (Shepherd 2001). Reading eventually sided with the Americans where he fought in Fremont's Battalion. Later, he was a signer of the Capitulation of Cahuenga, the treaty between Mexico and California that ended hostilities and indirectly led to California's statehood (Office of Historic Preservation 1996).

The United States annexed California in 1848 and the holders of most Mexican land grants were soon facing multiple legal battles. Many of the territory's new citizens were not acquainted with the large land holdings and consequently began squatting on what appeared to be open land. Although many grant holders fought to keep their land, the boundaries of the grants were often ill-defined, overlapping, or non-existent. To clarify and finalize holdings, the U.S. government passed the Land Act of 1851 which approved 553 claims, among them Reading's (Beck and Haase 1974; Bureau of Land Management 2006a). By 1862 Reading's ranch was recognized as the best stock farm in the state of California.

PHOTO: Maj. Pierson B. Reading, 1862. CD Id Number: 29. CD Frame Number: 26. Shasta Historical Society

PHOTO: Reading Adobe, Buena Ventura House, 1851, First County Seat of Shasta County, California. View north. CD Id Number: 60. CD Frame Number: 97. Shasta Historical Society

In addition to farming, Reading dabbled in politics, steamships, and gold mining (Shepherd 2001). During the Gold Rush, Reading assembled a group of "his Indians" to try his hand at placer mining, although his success is unknown (Robinson 1948). He apparently remained on good terms with the local Native Americans, and employed them on his ranch. At one point, he fended off an angry mob attempting to attack them. In 1851, Reading helped to negotiate the first treaty with the Native Americans in California (Shepherd 2001). He was appointed the "agent" for the Wintu, who were given 35 square miles of land and $25,000, to be managed by Reading (LaPena 1978). In 1844, Reading wrote:

> These Indians are quite different from any I have seen in the mountains or prairies, being mild and inoffensive in their manner, and easily taught the various duties of the farm. There are on my land two villages, each number 150 persons, men, women, and children. I am confident that by treating them kindly I can easily convert them into useful subjects, and at the same time improve their condition as human beings (Shepherd 2002a).

PHOTO: Group of 4 adults, 1 boy, standing at the boarded end of adobe. Group of Indians at Reading Adobe. CD Id Number: 29 CD Frame Number: 39 Shasta Historical Society

PHOTO: Man seated in ruins of Reading Adobe-interior exposure. "Old Tom at the ancient fireplace" CD Id Number: 29 CD Frame Number: 40 Shasta Historical Society

Reading died in May 1868 at the age of 51. Thereafter, the ranch was sold off piecemeal, and Charles C. Moore claimed the old adobe house (Hamusek 1994). Reportedly this adobe home was still standing in 1948 (Robinson 1948), although now it is reduced to a mound of earth. The Reading Adobe is listed as California Historical Landmark No. 10 (Office of Historic Preservation 1996).

Since the demise of P.B. Reading, the land apparently has been used primarily for agricultural purposes such as horticulture and cattle grazing. The detailed land use of these parcels over the last 100 years is unknown at this time, but cattle ranching and farming continue to be important factors in the local economy.

4. Cultural Resource Sites

Ethnographic villages were concentrated on the bluffs overlooking waterways (Moratto 1984:172), which mirrors the environmental setting of the MCCWA. Given the close proximity of Cottonwood Creek and the Sacramento River, there is a high probability that undocumented prehistoric sites exist within the MCCWA. In 1844, P.B. Reading noted the presence of two such villages on his property (LaPena 1978), which included the land that now makes up the MCCWA. The Reading Adobe is also immediately adjacent to the Cottonwood Creek Unit, and it is likely that there are Mexican and early American period components related to the adobe within the boundaries of the unit. The area experiences massive soil movement during flood season, and archaeological sites along waterways and on flood plains are frequently encountered several meters below the current ground surface. There is a high probability of encountering buried archaeological sites along the waterways adjacent to the Cottonwood Creek Unit.

During the 2006 reconnaissance survey, a new historical site was identified at the far north end of the BFW1 (Baxter, unpublished report). The exact location of this site is confidential. The site appears to be an old residence or homestead and is composed of a series of small concrete foundations, ditches, a water softener, a breaker box and meter on a pole, utility poles, and numerous non-native trees and shrubs (pear, tree of heaven [*Ailanthus altissima*], and other unidentified landscape species). The site was not recorded.

According to the records search by the Northeast Information Center, no previous archaeological surveys have been conducted on the BFW2 parcels. Several archaeological surveys have been conducted on adjacent and nearby properties. None of these surveys identified any archaeological sites (Northeast Information Center 2009).

A reconnaissance survey of the BFW2 property during 2009 identified several historic structures, formerly the Matthews dairy (Baxter, unpublished report). One is a small wood framed bungalow that is abandoned, dilapidated and overgrown with ivy and blackberries. The house probably dates back to the 1920s. The second structure is a large wood-framed hay barn. It is sided with iron sheeting, as is the roof. There are large sliding doors at opposite ends. Along the sides are a series of feed bins open to the outside. The bins are covered with large porch type roofs. It was probably erected about the same time as the house. The third structure is a small milking shed. As is typical of this kind of structure, the lower portions of the walls are made of concrete, and the upper portions are wood framed and sided with T-1-11 siding. The roof is clad in iron sheeting of various types. The interior is divided into three rooms: a milking room, a processing room with a separator, and a room that housed storage tanks. The milking shed was probably built about the same time as the house, although it has been at least partially rebuilt sometime during the 1960s or later.

PHOTO: Matthews Property. 2009 Past Forward Inc., S. Baxter

PHOTO: Hay Barn, Matthews Dairy. 2009 Past Forward Inc., S. Baxter

PHOTO: Milking Shed, Matthews Dairy. 2009 Past Forward Inc., S. Baxter

PHOTO: ACID Lateral #33, north end, BRW2. 2009, Past Forward Inc., S. Baxter

Also present is a historic ditch that runs through the middle of the site. The ditch is part of the Anderson-Cottonwood Irrigation District water control system and is known as Lateral #33. ACID staff had no records regarding the history of the ditch, but believed the Matthews family had built it circa 1920 (H. Lurtsema, ACID, personal communication). Other structures related to the ACID ditch include a concrete culvert that crosses under Balls Ferry Road and sliding gate valves used for flood irrigation of adjacent fields. The ditch is still used and maintained by ACID.

None of these resources were recorded during the course of this project. However, portions of the ACID water control system have been previously recorded. These were given Primary Numbers 91404 and 96818. Site 91404 was noted as an ACID aqueduct, and was not evaluated (DPR code 7L) for the National Register of Historic Places (NRHP). Site 96818 was found ineligible (code 6Y2) for the NRHP (JRP and Caltrans 2000). The locations of these segments of ditches are unknown. Other than these historic features, no unnatural landforms were noted during the archaeological reconnaissance surveys (Baxter, unpublished report).

5. Existing Structures

No structures were noted on the Cottonwood Creek Unit. The BFW1 has several standing structures related to the former owner's ranch, including a mobile home, horse shed, pole barn, single family ranch style home, two-story garage, pool house and pool, changing house, and an airplane hanger and landing strip (Figure II-n). None of these structures appear to be over 50 years old, and are not considered historic resources. Aside from the former Matthews dairy structures, there are no buildings on BFW2.

Figure II-n. Existing Buildings and Fences, Balls Ferry Wetland Units 1 and 2